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Costly Financial Intermediation and Excess Consumption Volatility*

Ayse Sapci†

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Abstract

This paper documents the cyclical properties of financial intermediation costs and uses their dynamics to explain excess consumption volatility differences across countries in a dynamic stochastic general equilibrium (DSGE) framework. I find that financial development levels have no role in explaining excess consumption volatilities. Instead, the volatility of the financial sector plays the determinative role. The model matches the data, finding excess consumption volatility to be four times higher in an average emerging country compared to the US. This paper also shows that if the US had the

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same intermediation cost structure as the average emerging country, deteriorations in the production, consumption, labor market, business investment, and real estate market following a financial shock would increase sixfold, on average.

JEL Classification: E21; E32; E44; G01; G21; O16

Keywords: Financial intermediation costs; Excess consumption volatility; Housing market; Financial development; Financial shocks
1. Introduction:

It has often been assumed that more developed financial systems lead to higher consumption smoothing through better risk insurance (see Aghion et al. (1999, 2004); Easterly et al. (2001); Denizer et al. (2002); Kose et al. (2003) and Fanelli (2008)). Using banks’ cost efficiency, or equivalently intermediation costs per assets which represents how much banks pay to raise a dollar worth of assets, as a proxy for financial development, I show that financial development levels have no role in explaining the excess consumption volatility (ECV, henceforth) differences across countries. Instead, the volatility of the financial sector created by financial shocks plays the ultimate role in determining ECVs.

The volatility of macroeconomic variables, particularly that of consumption, has detrimental economic effects by creating uncertainty and risk. Ramey and Ramey (1995) and Laursen and Mahajan (2005) among others, show that volatility leads to lower economic growth and social welfare.\footnote{Behrman (1988), Rose (1994), and Foster (1995) show that the lack of consumption smoothing cause significantly negative effects on the life expectancy, nutrition intake and education of households.} These negative effects are more pronounced in emerging countries than developed countries, even after controlling for crises by normalizing consumption with output.\footnote{Pallage and Robe (2003) find that the median welfare cost of aggregate fluctuations in poor countries is at least 10 times what it is in the United States.} Using a sample of 75 countries, Crucini (1997) finds that the volatility of consumption relative to output is 3.5 times higher in less developed countries. This paper explains the disparity in ECVs across countries by accounting for differences in their financial sectors.
cial intermediation costs. In a DSGE framework with a real estate market, I show that, instead of financial development levels, the volatility of financial systems creates ECV differences across countries. Because emerging countries have more volatile financial sector, their economy experiences greater credit crunches leading to more dramatic macroeconomic fluctuations. The spillover from the financial sector to the real estate market leads to higher excess consumption volatility. Since some developed financial systems are actually more volatile than others due to large information flow and large volume of trade, concentrating on financial development level differences is misleading in cross-country comparisons.

This paper improves upon existing literature in five main ways. First, this paper introduces the dynamics of financial intermediation costs. In the literature, financial intermediation costs - all non-interest expenses that banks incur- have been scarcely studied and generally treated as constant over time. For instance, although they represent a narrow version of intermediation costs, monitoring costs used in a costly state verification framework are assumed to be constant fractions of assets over time (see Townsend (1979) and Bernanke, Gertler and Gilchrist (1999)). Closer to the financial intermediation cost yet still in a static analysis, Antunes et al. (2013) show that a one percent reduction in these costs leads to a 1.9 percent increase in the US consumption. By constructing a high-frequency, bank-level dataset in the US, however, I show that financial intermediation costs are highly countercyclical and their dynamics have an important role at the macroeconomic level.

Second, because these costs affect the abundance of credit supply in an economy, they
provide a concrete way to measure financial shocks. Financial shocks attracted significant scholar attention particularly after the Great Recession. Papers such as Christiano, Motto, and Rostagno (2008), Del Negro et al. (2010) and Jermann and Quadrini (2012) show the important role of financial shocks as a source of macroeconomic fluctuations, however, these shocks cannot be observed directly from the data. Therefore, financial intermediation costs in this paper are the first attempt to have a tangible measure for financial shocks.

Third, I use financial intermediation costs as a proxy for financial development across countries. Demirguc-Kunt and Levine (2004) find that factors that are closely related to economic and financial development, such as regulations on bank entry, economic freedom, and property rights explain most of the cross country variations in these costs. Barth et al. (2004, 2005) show that intermediation costs are negatively correlated with private monitoring and less government ownership. Moreover, Beck (2007) demonstrates that less developed financial systems are typically characterized by high financial intermediation costs, and these costs are the major resource that create the wedge between deposit and lending interest rates. In this paper, I show that the intermediation costs are a good proxy to capture the development levels and volatility in financial markets not only across countries, but also across time.

Fourth, the model lets both households and firms have credit constraints instead of only firms (Liu, Wang and Zha, 2013). In a less than perfect world, all agents that borrow would face some credit constraints. Otherwise, all firms and households would be charged
the same rate, and it would be close to the riskless rate. Moreover, in an ideal world the borrowing power of firms and households would be unlimited. Yet, this is far from the reality. In the data, nearly 70% of all loans in the financial system are collateralized (Berger and Udell, 1990). Therefore, loans made available to households or firms are limited to their real assets, be it real estate or physical capital. This model uses the real estate and physical capital as the collateral value in the debt contract of both households and firms. Not only incorporating financial intermediation costs, but also including physical capital as part of firms’ collateral extends the framework used in Iacoviello (2005).

The last improvement of the model comes from its estimation power of higher moments. Models that include housing market interactions but not the intermediation costs, such as Campbell and Hercowitz (2005) and Iacoviello and Pavan (2011), tend to overshoot consumption volatility by overemphasizing the role of housing sector.\(^3\) However, the model in this paper explains the volatility differences between developed and emerging countries better by incorporating costly financial intermediation.

The general mechanism in this paper works as follows: An increase in intermediation costs is a negative financial shock in the economy that makes lending more costly for banks and decreases their incentives to provide loans leading to a credit crunch. The unavailability of credit causes lending rates to rise, making borrowing more difficult for households and firms.

\(^3\)Among those models, Iacoviello (2011) emphasizes the importance of the financial sector as well. In his model, banks have losses when borrowers default on their debt. Yet, these defaults take the form of a positive wealth shock for borrowers.
firms. Therefore, they stop accumulating assets (commercial and residential real estate and physical capital), and asset prices begin to fall. Because assets are also used as collateral, the price decline tightens credit constraints by decreasing collateral value. Tightened borrowing causes the demand for assets to fall even more, pushing prices down further and creating an amplification mechanism in the economy by deepening the credit crunch.

The remainder of the paper is organized as follows. Section 2 lays out the empirical motivation of this paper by introducing excess consumption volatility and financial intermediation costs. Section 3 outlines the model, while sections 4, 5 and 6 discuss the calibration and simulation results. Section 7 concludes.

2. Empirical Motivation:

This paper investigates excess consumption volatility differences among countries when a housing market and costly financial intermediation are included in a general equilibrium framework. To define the model’s empirical target, I first examine existing facts about the excess consumption volatility (ECV) across countries. In Section 2.2, I then analyze financial intermediation costs for the US and across developed and emerging countries in more detail to describe the mechanism of the model.

2.1. Relative Consumption Volatility to Output as a measure of ECV:

Relative consumption volatility is represented by either the standard deviation of the consumption to output ratio, $\sigma \left( \frac{C}{Y} \right)$, or the ratio of standard deviations of consumption
and output, \( \left( \frac{\sigma_C}{\sigma_Y} \right) \). These two measures have slightly different interpretations. While the former gives a ratio of consumption to output for each period, the latter gives the ratio over the total period. Both measures, however, represent excess consumption volatility compared to output. Because of the severe and frequent crises that emerging countries experience, their consumption and output are expected to be more volatile than developed countries. The relative consumption volatility, however, eliminates the effects of economic crises, as a negative shock to a country should decrease both consumption and output.

Using real aggregate consumption and real GDP data, Table 1 compares the volatility of macroeconomic variables from 1998:1 to 2011:4 for emerging and developed countries. The log values of the data are detrended with Hodrick Prescott filter before calculating their standard deviations. Table 1 shows that both consumption and output volatilities are higher in emerging countries. Moreover, there is a significant excess consumption volatility in emerging countries that is twice larger compared to the G-7 for both measures.

Even though Table 1 shows that the relative consumption volatilities, or in other words excess consumption volatilities, are significantly higher in emerging countries on average, choosing an aggregate measure has its limitations. I choose one country to represent emerging and developed country groups as opposed to averaging them, because averaging can lead to losses of some time series characteristics in the data particularly when higher moments are considered. I choose Turkey and the US for this purpose because they are median countries in terms of financial intermediation costs amongst emerging and developed
### Table 1: Volatility of Macroeconomic Variables

<table>
<thead>
<tr>
<th>Country</th>
<th>$\sigma(C)$</th>
<th>$\sigma(Y)$</th>
<th>$\frac{\sigma(C)}{\sigma(Y)}$</th>
<th>$\sigma \left( \frac{C}{Y} \right)$</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Argentina</strong></td>
<td>4.49%</td>
<td>3.79%</td>
<td>1.19</td>
<td>1.11%</td>
</tr>
<tr>
<td><strong>Brazil</strong></td>
<td>1.38%</td>
<td>1.46%</td>
<td>0.95</td>
<td>1.17%</td>
</tr>
<tr>
<td><strong>India</strong></td>
<td>1.84%</td>
<td>1.58%</td>
<td>1.17</td>
<td>2.16%</td>
</tr>
<tr>
<td><strong>Korea</strong></td>
<td>2.25%</td>
<td>1.73%</td>
<td>1.30</td>
<td>1.37%</td>
</tr>
<tr>
<td><strong>South Africa</strong></td>
<td>1.72%</td>
<td>1.26%</td>
<td>1.37</td>
<td>0.79%</td>
</tr>
<tr>
<td><strong>Turkey</strong></td>
<td>3.89%</td>
<td>3.90%</td>
<td>1.00</td>
<td>1.95%</td>
</tr>
<tr>
<td><strong>Emerging</strong></td>
<td><strong>2.60%</strong></td>
<td><strong>2.28%</strong></td>
<td><strong>1.16</strong></td>
<td><strong>1.43%</strong></td>
</tr>
<tr>
<td><strong>Canada</strong></td>
<td>0.73%</td>
<td>1.17%</td>
<td>0.63</td>
<td>0.87%</td>
</tr>
<tr>
<td><strong>France</strong></td>
<td>0.61%</td>
<td>1.17%</td>
<td>0.52</td>
<td>0.83%</td>
</tr>
<tr>
<td><strong>Germany</strong></td>
<td>0.70%</td>
<td>1.78%</td>
<td>0.39</td>
<td>1.53%</td>
</tr>
<tr>
<td><strong>Italy</strong></td>
<td>0.80%</td>
<td>1.46%</td>
<td>0.55</td>
<td>0.99%</td>
</tr>
<tr>
<td><strong>Japan</strong></td>
<td>0.84%</td>
<td>1.66%</td>
<td>0.50</td>
<td>1.16%</td>
</tr>
<tr>
<td><strong>UK</strong></td>
<td>1.09%</td>
<td>1.52%</td>
<td>0.72</td>
<td>0.73%</td>
</tr>
<tr>
<td><strong>US</strong></td>
<td>1.11%</td>
<td>1.34%</td>
<td>0.83</td>
<td>0.45%</td>
</tr>
<tr>
<td><strong>G-7</strong></td>
<td><strong>0.84%</strong></td>
<td><strong>1.44%</strong></td>
<td><strong>0.59</strong></td>
<td><strong>0.94%</strong></td>
</tr>
</tbody>
</table>

Notes: Consumption and GDP data are obtained from EIU Country Data.
countries, respectively. Moreover, to be consistent with the structure of the model, I separated the housing services (rent and utilities) from aggregate consumption and output, and reported the findings in the Appendix A which establishes the main quantitative target for the model simulations. None of these robustness checks change the overall empirical target, but they make the analysis more vigorous.

2.2. Financial Intermediation Costs:

2.2.1. Cost Analysis for the US:

The unique dataset of this paper contains financial intermediation costs and assets of individual banks. They are obtained from Mergent Online’s collection of bank income statements and balance sheets. This micro level data covers the top 100 largest commercial banks with asset sizes larger than 5 billion dollars that have the data availability for the period of 1998:1-2011:4.\(^4\) With over 3200 observations, this dataset represents all commercial banks in the US well by capturing 55 percent of total assets in the sector.\(^5\) Quarterly frequency of the data allows the study of the relationship between intermediation costs and business cycles, and helps to introduce a non-trivial banking sector. To the best of my knowledge, this is the first study that examines the business cycle properties of financial

\(^4\)To maintain the consistency across time and banks, some banks are deducted from the analysis. Therefore there are around 40 banks in total in the analysis.

\(^5\)Data for total assets of all commercial banks is obtained from FRED, Federal Reserve Economic Data of St. Louis.
intermediation costs using high frequency data.

Financial intermediation costs consist of all non-interest costs that a bank undertakes to operate. These costs include such expenses as personnel, marketing, litigation and data processing and are sometimes called overhead costs. Table 2 presents intermediation costs of Fifth Third Bank to illustrate the types of expenses that a bank typically incurs.\(^6\)

This dataset uncovers an important empirical fact about financial intermediation costs: they increase sharply during recessions and decrease during expansions, indicating a countercyclical nature. Figure 1 demonstrates the cyclical behavior of financial intermediation costs. It plots the detrended total costs for all banks in the sample using Hodrick-Prescott Filter. Grey shaded areas indicate the 2001:1-2001:4 and 2007:4-2009:3 recessions. Costs tend to increase beyond the trend during recessions.

Although almost all cost items increase during recessions, some of them, such as loan processing expenses, professional service fees, litigation expenses, and marketing expenses cause a major spike in total intermediation costs. During recessions, banks usually have increasing difficulties in collecting accurate information about borrowers due to the adverse selection problem created by the uncertainty in the economy, and therefore, incur higher loan processing expenses. Moreover, in recessions, borrowers tend to default on loans which leads to higher intermediation costs as banks hire analysts, consultants, attorneys and

\(^6\)Fifth Third Bank is chosen for its detailed cost decomposition. Most of the other banks report their aggregate costs without providing much detail except the large items such as salaries, litigation and occupancy.
Table 2: Intermediation Costs of Fifth Third Bank

<table>
<thead>
<tr>
<th>in millions</th>
<th>2007</th>
<th>2008</th>
<th>2009</th>
<th>2010</th>
<th>2011</th>
</tr>
</thead>
<tbody>
<tr>
<td>Salaries, Wages &amp; Incentives</td>
<td>1239</td>
<td>1337</td>
<td>1339</td>
<td>1430</td>
<td>1478</td>
</tr>
<tr>
<td>Employee Benefits</td>
<td>278</td>
<td>278</td>
<td>311</td>
<td>314</td>
<td>330</td>
</tr>
<tr>
<td>Net Occupancy</td>
<td>269</td>
<td>300</td>
<td>308</td>
<td>298</td>
<td>305</td>
</tr>
<tr>
<td>Technology &amp; Communications</td>
<td>169</td>
<td>191</td>
<td>181</td>
<td>189</td>
<td>188</td>
</tr>
<tr>
<td>Card &amp; Processing</td>
<td>244</td>
<td>274</td>
<td>193</td>
<td>108</td>
<td>120</td>
</tr>
<tr>
<td>Equipment Expenses</td>
<td>123</td>
<td>130</td>
<td>123</td>
<td>122</td>
<td>113</td>
</tr>
<tr>
<td>Loan Processing</td>
<td>119</td>
<td>188</td>
<td>234</td>
<td>211</td>
<td>195</td>
</tr>
<tr>
<td>Marketing Expenses</td>
<td>84</td>
<td>102</td>
<td>63</td>
<td>77</td>
<td>58</td>
</tr>
<tr>
<td>Affordable Housing Investments</td>
<td>57</td>
<td>67</td>
<td>83</td>
<td>100</td>
<td>85</td>
</tr>
<tr>
<td>Professional Services Fees</td>
<td>35</td>
<td>102</td>
<td>63</td>
<td>77</td>
<td>58</td>
</tr>
<tr>
<td>Travel Expenses</td>
<td>54</td>
<td>54</td>
<td>41</td>
<td>51</td>
<td>52</td>
</tr>
<tr>
<td>Postal &amp; Courier</td>
<td>52</td>
<td>54</td>
<td>53</td>
<td>48</td>
<td>49</td>
</tr>
<tr>
<td>Operating Lease Expenses</td>
<td>22</td>
<td>32</td>
<td>39</td>
<td>41</td>
<td>41</td>
</tr>
<tr>
<td>Recruitment &amp; Education</td>
<td>-</td>
<td>33</td>
<td>30</td>
<td>31</td>
<td>31</td>
</tr>
<tr>
<td>Data Processing</td>
<td>-</td>
<td>-</td>
<td>33</td>
<td>30</td>
<td>31</td>
</tr>
<tr>
<td>Insurance</td>
<td>-</td>
<td>-</td>
<td>21</td>
<td>24</td>
<td>29</td>
</tr>
<tr>
<td>Intangible Asset Amortization</td>
<td>42</td>
<td>56</td>
<td>57</td>
<td>43</td>
<td>22</td>
</tr>
<tr>
<td>Supplies</td>
<td>31</td>
<td>31</td>
<td>25</td>
<td>24</td>
<td>18</td>
</tr>
<tr>
<td>Visa Litigation Reserve</td>
<td>172</td>
<td>(99)</td>
<td>(73)</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Provision for Unfunded Commitments</td>
<td>-</td>
<td>98</td>
<td>99</td>
<td>(24)</td>
<td>(46)</td>
</tr>
<tr>
<td>Other Non-interest Expense</td>
<td>298</td>
<td>371</td>
<td>546</td>
<td>408</td>
<td>381</td>
</tr>
<tr>
<td>Total Other Non-interest Expense</td>
<td>1012</td>
<td>2127</td>
<td>1664</td>
<td>1856</td>
<td>1588</td>
</tr>
<tr>
<td>Total Non-interest Expense</td>
<td>3311</td>
<td>4564</td>
<td>3826</td>
<td>3855</td>
<td>3758</td>
</tr>
</tbody>
</table>

Notes: Data is obtained from Mergent Online. Some of the accounts are organized for consistency purposes.
Figure 1: Detrended Aggregate Intermediation Costs

Notes: The jump in the last quarter of 1998 is due to big mergers at the time. For instance, the merger of Wells Fargo and Norwest increased the costs 5 times, the merger of Suntrust and Crestor increased the costs 3 times and the acquisition of Bank of America by Nationsbank doubled the costs in recordings.
accountants to address the rising number of defaults as well as to overcome adverse selection problem. For instance, the professional service fees, which are normally stable, increased more than three times for International Bank of Commerce during the recent recession. Additionally, as more and more borrowers declare bankruptcy due to unfavorable economic conditions, bank litigation expenses increase dramatically. From 2007 to 2009, First Bank had more than four times increase in its legal costs. During recessions, banks also try to regain their lost reputation by investing more on marketing. For example, Old National Bank’s marketing expenses tripled during the recent recession.

Increases in financial intermediation costs do not always, however, indicate a financial crisis. As assets increase (e.g., as banks provide more loans or open new branches) it is natural to expect a proportional increase in intermediation costs. The end of 1998 jump in Figure 1 demonstrate this point as well. The reason of the increase in costs was the large amounts of mergers happened in that time period which also increased asset sizes of those banks. To analyze this point further, Figure 2 plots real aggregate intermediation costs and real total assets for the sample. Both series are detrended with Hodrick-Prescott filter. Grey shaded areas again indicate the recessions within the time period. The figure shows that the detrended costs and assets move very closely with a correlation 63 percent. Therefore, cost levels do not contain enough information to distinguish the source of changes. The ratio of intermediation costs to total assets, on the other hand, can capture the increases or decreases independent of assets. Figure 3 shows the countercyclical feature of these costs by
using intermediation cost to total asset ratio for the aggregated sample. Again in this figure, intermediation costs per assets increase dramatically during recessions.

2.2.2 Cost Analysis across Developed and Emerging Countries:

Beck et al. (2010) aggregate financial intermediation costs at country level and report them annually as a ratio to total assets for 77 countries between 1993 and 2009. Using a subset of their dataset, Figure 4 compares intermediation costs to total assets ratios for the US and the average of the 16 emerging countries over time. \(^7\) Even though the ratio

\(^7\)Emerging countries included in the analysis are Argentina, Brazil, Chile, Colombia, Egypt, Hungary, India, Indonesia, Korea, Malaysia, Peru, Philippines, Russia, South Africa, Turkey and Venezuela.
Figure 3: Intermediation Costs / Total Assets for the US

Notes: There are some idiosyncratic and externally caused increases in the cost data. In particular, the end of 1998 and the beginning of 1999 jump was due to the negative effects of the crises started in Russia, East Asia and Latin America as well as the US stock market crush. The Financial Services Act in 1999 also encouraged the mergers and acquisitions which increased the costs initially.
Figure 4: Financial Intermediation Costs / Total Assets for the US and Emerging Countries

Notes: The shaded areas show the recessionary periods since 1993. While the values for the US corresponds to the right scale, emerging countries are subject to the left scale. For the list of the emerging countries see footnote 6.

decreased over time as a result of financial development, it increased significantly both in the 2001 and 2007-2009 recessions.

The intermediation cost to asset ratio can also be interpreted as cost efficiency which is closely related with financial development. In particular, we expect more developed financial sectors to have lower cost per asset ratio. In other words, developed financial systems should have a higher cost efficiency as well. In this paper, I use the cost per asset ratio as a general indicator of the development level and the volatility of financial systems. To
show the validity of this claim, Figure 5 sorts countries from most cost efficient (lowest intermeditation cost per asset) on the left to the least cost efficient on the right. Then the figure plots the broadly used definitions of financial development, i.e. domestic credit to private sector, deposit money banks’ assets and liquid liabilities as percentages of GDP. If the cost efficiency is a good proxy for financial development then we expect all measures to be negatively sloped in this graph. Indeed, the most cost efficient countries on the left of the graph seem to also have high financial development whereas financial development level declines as countries get less cost efficient. Figure 6, on the other hand, shows whether cost efficiency fluctuations over time can represent the general financial volatility in the US. The figure plots two commonly used financial volatility indicator. (VIX and volatility of stock price index) as well as the volatility of intermediation costs per asset. The volatility of the cost ratio increases during recessions and it moves very closely with the other two financial volatility indicators. Although not a perfect proxy, both Figures 5 and 6 show that intermediation costs per assets does a good job in capturing the financial development level differences across countries and financial volatility across time.

Table 3 provides more information on financial intermediation costs per assets across country groups. According to this table, an average bank in a developed country pays 3.3 cents to raise one dollar of assets, whereas an average bank in an emerging country pays around 5.3 cents. Consistent with the literature, Table 3 further shows that the volatility of intermediation costs increases as the financial development decreases. However, contrary to
Figure 5: Intermediation Costs as a Proxy for Financial Development

Notes: Data are obtained from Global Financial Development Database (GFDD), The World Bank.
Figure 6: Intermediation Costs as a Proxy for Financial Sector Volatility

Notes: Data are obtained from FRED, Federal Reserve Economic Data, Federal Reserve Bank of St. Louis
the general belief, the correlation between the average level of development and the volatility of financial sector is only 42 and 67 percentages for G-7 and emerging countries, respectively. UK and Philippines provide only one example showing that higher development levels (mean of the costs to assets ratio) do not necessarily lead to lower volatilities (standard deviation of the costs to assets ratio). Figure 7 further shows this point as well. In this figure, countries are sorted by their financial volatilities using the standard deviation of cost to asset ratio. According to the general consensus, we expect a clear negative relationship between financial development levels and financial volatility across these countries. In particular, the least volatile countries on the left should also be the most developed ones. However, Figure 7 does not show a clear pattern between development levels and volatility. Therefore, just accounting for financial development levels might be misleading in cross country analyses.

3. Model:

The model is an extended version of both Iacoviello (2005) and Liu, Wang and Zha (2013). This model improves upon both models by including credit constraints in the
Figure 7: Financial Development and Financial Volatility

Notes: Data are obtained from Global Financial Development Database (GFDD), The World Bank.
borrowing decisions of both households and firms, by introducing physical capital as a part of collateralization process in debt contracts, and by introducing costly financial intermediation.

In this model, there are patient and impatient households, a representative firm, and a bank. The bank intermediates between borrowers and savers at a cost and requires some of borrower’s real estate and physical capital to be collateralized.

3.1 Households:

There are two fundamental differences between the households in the model. First, patient households give greater value to the future than impatient households. Specifically, I assume that the discount factor of patient households is larger than that of impatient households.\(^8\) This assumption guarantees an equilibrium in which the borrowing constraint of impatient households always binds. The second difference between the two types of households is that only impatient households can engage in housing market activities. This assumption helps accounting for individuals who do not want to buy (or not capable of buying) real estate.

3.1.1. Patient Households:

Denoted with subscript \(p\), patient households make their consumption, \(C_{p,t}\), and leisure, \(l_{p,t}\), decisions at time \(t\) and their total endowment of time is normalized to one.

\(^8\)I assume that \(\beta_p > \beta_i(1 + \bar{c})\) where \(\bar{c}\) denotes the long run average financial intermediation cost as a ratio to total assets. Since this ratio is very small, the assumption holds for any reasonable value used in the literature.
They also decide how much to save, $D_{t+1}$, at the bank for a return of the gross deposit rate, $R_{t+1}$. The patient households use the following objective function to maximize their lifetime utility from consumption and leisure.

$$\max_{C_{p,t},L_{p,t},D_{t+1}} \mathbb{E}_t \left\{ \sum_{k=0}^{\infty} \beta_p^k \left[ \ln(C_{p,t+k}) - \frac{j_{p,t+k}^\xi}{\xi} \right] \right\}$$

The maximization is subject to the following Walrasian budget constraint that equates households’ spending to their income.

$$C_{p,t} + D_{t+1} = R_t D_t + W_t l_{p,t}$$

(1)

First order conditions to the problem of patient households are given by the following standard consumption Euler equation and the labor supply decision, respectively.

$$1 = \mathbb{E}_t \left\{ \frac{\beta_p C_{p,t}}{C_{p,t+1}} \right\} R_{t+1}$$

(2)

$$j_{p,t}^{\xi-1} = \frac{W_t}{C_{p,t}}$$

(3)

3.1.2. Impatient Households:

Impatient households engage in housing market activities by making a debt contract with the bank. They buy real estate, $H_{i,t+1}$, from the price $Q_t^h$ at time $t$. However, the
bank requires some of their assets to be collateralized which restrains the available credit to borrowers.

Impatient households maximize their utility from consumption and leisure as well as the utility that they get from housing services. They use the following objective function to maximize their utility subject to their flow of funds constraint in Equation (4) and the collateral constraint in Equation (5).

\[
\max_{C_{i,t}, H_{i,t+1}, l_{i,t}, l_{i,t+1}, B_{i,t+1}} \mathbb{E}_t \left\{ \sum_{k=0}^{\infty} \beta_i^k \left[ \ln(C_{i,t+k}) + \Gamma \ln(H_{i,t+k}) - \frac{l_{i,t+k}}{\xi} \right] \right\}
\]

Represented with the subscript \(i\), impatient households can use the amount borrowed from banks, \(B_{i,t+1}\), their labor income, \(W_{t,l_t}\), and the return from previous investment, \(Q_{t}^h H_{i,t}\), to finance their consumption, new housing investment, and repayment of their debt as shown in Equation (4). \(Z_t\) denotes the gross lending rate while \(\phi\) shows the adjustment cost of housing.

\[
C_{i,t} + Q_{t}^h H_{i,t+1} + \frac{\phi}{2} \left( \frac{H_{i,t+1} - H_{i,t}}{H_{i,t}} \right)^2 Q_{t}^h H_{i,t} = Q_{t}^h H_{i,t} - Z_t B_{i,t} + B_{i,t+1} + W_{t,l_t} \quad (4)
\]

Banks require some of the real estate to be used as collateral. With this collateral constraint households can borrow up to a limit.

\[
Z_{t+1} B_{i,t+1} \leq \mathbb{E}_t \left\{ Q_{t+1}^h H_{i,t+1} \right\} \quad (5)
\]
Equation (5) shows that the repayment of households’ debt cannot exceed the expected future value of the real estate bought at time $t$. Equations (6) and (7) give the first order conditions to impatient households’ problem that show labor supply, consumption and housing demand decisions, respectively.

$$l_{i,t}^{\xi-1} = \frac{W_t}{C_{i,t}}$$

$$E_t \left[ \beta_i \left\{ \frac{\Gamma}{H_{i,t+1}} + \frac{Q_{t+1}^h}{C_{i,t+1}} \frac{\phi}{2} \left( \left( \frac{H_{i,t+2}}{H_{i,t+1}} \right)^2 - 1 \right) \right\} \right] = \frac{Q_t^h}{C_{i,t}} \left( 1 + \phi \left( \frac{H_{i,t+1}}{H_{i,t}} - 1 \right) - \frac{Q_{t+1}^h}{Z_{t+1} Q_t^h} \right)$$

3.2. Entrepreneurs:

Entrepreneurs (or equivalently firms) produce a homogenous good, $Y_t$, using capital and labor both from patient and impatient households as well as the commercial real estate in the following aggregate Cobb-Douglas production function.

$$Y_t = A_t K_t^\alpha H_{e,t}^\kappa L_{i,t}^{(1-\alpha-\kappa)} L_{p,t}^{(1-\nu)(1-\alpha-\kappa)}$$

where $\alpha \geq 0$ and $\kappa \geq 0$ and denotes the capital and commercial estate shares in production, respectively. $\nu$ gives the relative size of impatient to patient households and $A_t$ is the total factor productivity (TFP) that follows the AR (1) process in Equation (9).
\[ \log A_t = \rho_A \log A_{t-1} + \varepsilon_t^A \]  

(9)

where \( \rho_A \) is the persistency of TFP shock, and \( E(\varepsilon_t^A) = 0 \). Entrepreneurs also maximize their consumption with respect to Equations (8) and (9) as well as their flow of funds in Equation (10) and borrowing constraint in Equation (11).

\[
\max_{C_{e,t}, K_{t+1}, H_{e,t+1}, L_{e,t}, B_{e,t+1}} \quad E_t \left\{ \sum_{k=0}^{\infty} \beta^k \ln(C_{e,t+k}) \right\}
\]

\[
C_{e,t} + Q_t^h H_{e,t+1} + Z_{t} B_{e,t} + \frac{\phi}{2} \left[ \frac{H_{e,t+1} - H_{e,t}}{H_{e,t}} \right]^2 Q_t^h H_{e,t} = Y_t + Q_t^h H_{e,t} - W_t L_{e,t} - Q_t I_t + B_{e,t+1} - \frac{\psi}{2} \left[ \frac{I_t}{K_t} - \delta \right]^2 Q_t K_t
\]

(10)

where \( K_{t+1} - (1 - \delta) K_t = I_t \) denote the law of capital motion and \( L_{e,t} = L_{p,t} + L_{i,t} \) represents the total labor demand in the economy. As in impatient households, entrepreneurs can only borrow up to the expected future value of their total assets. The borrowing constraint is given by:

\[
Z_{t+1} B_{e,t+1} \leq E \left\{ Q_{t+1}^h H_{e,t+1} + Q_{t+1} K_t \right\}
\]

(11)

The solution of entrepreneurs’ maximization problem is given by the following four equations. They represent the demand for capital, housing, impatient household’s labor and patient household’s labor, respectively.
\[
\begin{align*}
\beta_e \left\{ \frac{Q_{t+1}}{C_{e,t+1}} \left[ \frac{\alpha Y_{t+1}}{Q_{t+1} K_{t+1}} + (1 - \delta) + \frac{\psi}{2} \left( \left( \frac{K_{t+2}}{K_{t+1}} \right)^2 - 1 \right) + \frac{Q_{t+2}}{Q_{t+1} Z_{t+2}} \right] - \beta_e Q_{t+2} \right\} \\
= \frac{Q_t}{C_{e,t}} \left[ \psi \left( \left( \frac{K_{t+1}}{K_t} \right) - 1 \right) + 1 \right]
\end{align*}
\] (12)

\[
\begin{align*}
\beta_e \left\{ \frac{Q_{t+1}^b}{C_{e,t+1}} \left[ \frac{\kappa Y_{t+1}}{Q_{t+1}^b H_{e,t+1}} + \frac{\phi}{2} \left( \left( \frac{H_{e,t+2}}{H_{e,t+1}} \right)^2 - 1 \right) \right] \right\} \\
= \frac{Q_t^b}{C_{e,t}} \left[ \phi \left( \left( \frac{H_{e,t+1}}{H_{e,t}} \right) - 1 \right) + 1 - \frac{Q_{t+1}^b}{Z_{t+1} Q_t^b} \right]
\end{align*}
\] (13)

\[
\nu (1 - \alpha - \kappa) \frac{Y}{L_{i,t}} = W_t
\] (14)

\[
(1 - \nu) (1 - \alpha - \kappa) \frac{Y}{L_{p,t}} = W_t
\] (15)

3.3 Banks:

Banks operate in a perfectly competitive market and are identical. Due to the arbitrage, an optimal contract between the representative bank and borrowers must satisfy the following condition.

\[
Z_{t+1} B_{t+1} = R_{t+1} (1 + c_t) B_{t+1}
\] (16)

In the arbitrage condition, \( c_t \) represents the financial intermediation cost as a ratio to total assets. The left hand side of Equation (16) captures the bank’s expected return.
from lending, whereas the right hand side represents how much could the bank have gained if it accepted the riskless rate instead of lending. Therefore, Equation (16) suggests that arbitrage would equate the bank’s expected return from lending to its opportunity cost. Notice that the bank has to pay $1 + c_t$ to provide a dollar worth of loans to borrowers. $c_t$ is multiplicative to $B_{t+1}$ because the cost itself is also a ratio to total assets in the data. From Equation (16), higher cost of intermediation increases the opportunity cost of lending.

Finally, $c_t$ follows the AR(1) process shown in Equation (17).

$$\ln c_t = (1 - \rho^c) \ln \bar{c} + \rho^c \ln c_{t-1} + \varepsilon_t$$ \hspace{1cm} (17)

Notice that the intermediation cost does not become zero in the steady state. Instead, it approaches to its long run average $\bar{c}$ because in reality costs never diminish entirely.

### 3.4 Market Clearing Conditions:

The economy-wide resource constraint is shown below where $I_t$ denotes the gross investment.

$$Y_t = C_t + I_t$$ \hspace{1cm} (18)

In Equation (18) $C_t$ represents the aggregate consumption and is a sum of all households and entrepreneurs’ consumptions as shown in Equation (19).

$$C_t = C_{i,t} + C_{p,t} + C_{e,t}$$ \hspace{1cm} (19)
The following labor market clearing conditions guarantee that the demand for and supply of labor will be equal.

\[ L_{p,t} = l_{p,t} \]  \hspace{1cm} (20)

\[ L_{i,t} = l_{i,t} \]  \hspace{1cm} (21)

Lastly, Equation (22) shows that the loans market clears when supply of deposits by banks is equal to the demand for funds by both impatient households and entrepreneurs.

\[ D_{t+1} = B_{i,t+1} + B_{e,t+1} \]  \hspace{1cm} (22)

4. Model Parametrization:

I choose standard values for the taste and technology parameters as listed in Table 4. The capital share in production and the depreciation rate of capital are set to 0.35 and 0.10, respectively, whereas the weight of leisure in both household’s utility function is set so that the aggregate labor supply is one third of the endowed time.

Lawrence (1991) and Samwick (1997) estimate the discount factor for patient and impatient households. While Lawrence (1991) estimates the quarterly discount rate of impatient households to be between 0.95 and 0.98, Samwick (1997) finds the discount factors for all agents to be between 0.91 and 0.99. Consistent with these findings, I choose 0.95 and
0.99 for the quarterly discount rates of impatient and patient households, respectively and set entrepreneurs’ discount rate to 0.98. The relative size of impatient households, \( \nu \), is set to 66 percent which captures share of homeowners in the data.

As is common in the literature, I set the persistence of the TFP to 0.95 with a standard deviation of 0.009. The weight of housing in the utility function is chosen so that in equilibrium the ratio of housing stock to output is 1.4, which is in line with data from the Flow of Funds accounts (see e.g. Table B.100, row 4). Lastly, I vary capital adjustment costs, \( \phi \), in the \([0, 0.4]\) range which is the plausible range estimated in the literature.

In the model parametrization, US and Turkey are assumed to have identical economic conditions except their financial sectors to pin down the effects coming from intermediation costs.

5. Results:

5.1. Model’s Fit:

Table 5 shows that the model fits the data for the US and Turkey fairly well even when we assume the economic conditions in both countries are identical except for their financial sector.

In the data, US consumption and output volatilities are 1.27 and 1.52 percent, respectively, whereas the model finds them to be 1.31 and 2.18. Given that the intermediation cost creates the only difference between the countries, the model expectably underestimates
Table 4: Calibration of Parameters

<table>
<thead>
<tr>
<th>Description</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>capital share in production α</td>
<td>0.35</td>
</tr>
<tr>
<td>discount factor for impatient households β_i</td>
<td>0.83</td>
</tr>
<tr>
<td>discount factor for entrepreneurs β_e</td>
<td>0.92</td>
</tr>
<tr>
<td>discount factor for patient households β_p</td>
<td>0.96</td>
</tr>
<tr>
<td>relative share of impatient households ν</td>
<td>0.66</td>
</tr>
<tr>
<td>depreciation rate δ</td>
<td>0.1</td>
</tr>
<tr>
<td>housing adjustment cost φ</td>
<td>[0, 0.4]</td>
</tr>
<tr>
<td>persistence of TFP ρ_A</td>
<td>0.95</td>
</tr>
<tr>
<td>standard deviation of TFP σ_A</td>
<td>0.009</td>
</tr>
<tr>
<td>average intermediation cost/total assets (\bar{c}_{US})</td>
<td>0.0356</td>
</tr>
<tr>
<td>persistence of intermediation cost (\rho_{US})</td>
<td>0.99</td>
</tr>
<tr>
<td>standard deviation of intermediation cost (\sigma_{US})</td>
<td>0.072</td>
</tr>
<tr>
<td>(\sigma_{TR})</td>
<td>0.24</td>
</tr>
</tbody>
</table>

Notes: One period in the model corresponds to one year. Thus, the values in the table match the annual frequency.

Table 5: Model’s fit

<table>
<thead>
<tr>
<th>in percent</th>
<th>Data</th>
<th>Model</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Quarterly</td>
<td>Annual</td>
</tr>
<tr>
<td></td>
<td>US</td>
<td>TUR</td>
</tr>
<tr>
<td>(\sigma(C))</td>
<td>1.51</td>
<td>12.66</td>
</tr>
<tr>
<td>(\sigma(Y))</td>
<td>1.59</td>
<td>13.17</td>
</tr>
<tr>
<td>(\sigma(C/Y))</td>
<td>0.58</td>
<td>3.25</td>
</tr>
<tr>
<td>(\sigma(C)/\sigma(Y))</td>
<td>0.95</td>
<td>0.96</td>
</tr>
</tbody>
</table>

Notes: Values are in percent. To be consistent with the model estimates, the aggregate consumption does not include the housing consumption. The period of the data is aligned to the period used to estimate intermediation costs. Particularly, the data period is 1998:1-2009:4. They are logged and then detrended using the HP filter. Both the data and the model has been calculated with the same method. Because one period in the model corresponds to one year, the data are also matched to the annual frequency and reported separately.
the volatility in Turkey. If, however, other parameters were calibrated to the Turkish economy, the findings for consumption and output volatilities would have been higher. It would then, however, be impossible to isolate the effects of intermediation costs, which are the main focus of this paper. Nevertheless, intermediation costs alone can account for 60 percent of the variations in Turkey and create higher macroeconomic volatility compared to the US.

Moreover, both measures of the relative consumption volatility findings are also in line with the data. Specifically, while $\sigma \left( \frac{C}{Y} \right)$ shows that the relative volatility of consumption is 3 times higher in Turkey, the model estimates this difference to be 4 times. $\frac{\sigma(C)}{\sigma(Y)}$ is on the other hand 2 times higher in the model for Turkey, whereas it is 1.23 times higher in the data. Therefore, the model confirms the differences in excess consumption volatilities of the US and Turkey, the latter being higher than the former, as expected.

5.2. Variance Decomposition:

Table 6 shows the variance decomposition of the two shocks in the economy, TFP and the financial shock. Intermediation cost, as a financial shock, is the primary source of volatility in the economy. In particular, it accounts for 89 and 65 percent of the variations in consumption and output, respectively. Additionally, it is the major source of volatility for the housing market, causing 90 percent of variations in housing prices due to its direct effect on the borrowing ability of impatient households and entrepreneurs. Furthermore, the shock creates around 83 percent of the volatility in investment and labor sectors. The loan
rates are affected almost only from the financial shock causing 98 percent of their variation. The effects of the financial shock become stronger as the housing adjustment cost increases. High adjustment costs make the housing sector costly to use as a buffer, therefore it creates higher volatility in the economy.

<table>
<thead>
<tr>
<th>Variable</th>
<th>$\phi = 0$ TFP</th>
<th>$\phi = 0.4$ TFP</th>
<th>$\phi = 0$ Financial Shock</th>
<th>$\phi = 0.4$ Financial Shock</th>
</tr>
</thead>
<tbody>
<tr>
<td>Output</td>
<td>34.88</td>
<td>22.09</td>
<td>65.12</td>
<td>77.91</td>
</tr>
<tr>
<td>Consumption</td>
<td>11.49</td>
<td>12.18</td>
<td>88.51</td>
<td>87.82</td>
</tr>
<tr>
<td>Labor Hours</td>
<td>16.46</td>
<td>13.37</td>
<td>83.54</td>
<td>86.63</td>
</tr>
<tr>
<td>Investment</td>
<td>18.40</td>
<td>14.16</td>
<td>81.60</td>
<td>85.84</td>
</tr>
<tr>
<td>House Prices</td>
<td>9.89</td>
<td>10.90</td>
<td>90.11</td>
<td>89.10</td>
</tr>
<tr>
<td>Loan Rate</td>
<td>1.84</td>
<td>5.88</td>
<td>98.16</td>
<td>94.12</td>
</tr>
</tbody>
</table>

Notes: The values are in percentage units.

6. **Simulation Results:**

Section 6.1. studies the effects of total factor productivity and financial shocks in the US and shows the role of housing adjustment costs in the economy. Section 6.2. compares the responses of the US and Turkey to both shocks assuming that the adjustment cost is zero. In this comparison, US and Turkey are assumed to have identical economic conditions except their financial sectors to pin down the effects coming from intermediation costs.

6.1. **Simulation Results for the US:**
Figure 8 shows the effects of one standard deviation decrease in neutral technology on the economy simulated for the US. The responses are reported with three values of housing adjustment cost, $\phi \in \{0, 0.2, 0.4\}$. As expected, a decrease in TFP leads to lower output and consumption, though the decrease in the latter is smaller due to consumption smoothing. Therefore, impatient households decumulate real estate which drives down house prices. As the value of asset holdings decreases, the borrowing constraint tightens. The tight borrowing constraint reduces the amount that households and entrepreneurs can borrow, leading to a decline in capital and real estate demands. The decrease in demand pushes prices further down and therefore creates a negative amplification effect in the economy. The income decrease also causes a substitution effect for households, leading to a decrease in the total labor supply. Housing adjustment cost seem to amplify initial responses but in the longer run it does not have a significant impact on the economy.

Figure 9 shows the responses to a one standard deviation increase in intermediation costs under different housing adjustment cost parametrizations. The mechanism in the model works as follows. When intermediation costs increase, lending becomes more costly for banks and their incentives to provide loans decrease, leading to a credit crunch in the loan market. The unavailability of credit causes lending rates to rise, which decreases the incentives to borrow. As impatient households and entrepreneurs find it more difficult to obtain funding, they stop accumulating real estate and house prices begin to fall. The price decline tightens credit constraints and causes entrepreneurs to demand less capital as well,
Figure 8: Responses to the TFP shock

Notes: The figures show the responses of key macroeconomic variables to a one standard deviation shock to the TFP for the US under different parametrization of the housing adjustment cost.
Figure 9: Responses to Intermediation Cost Shock

Notes: The figures show the responses of key macroeconomic variables to a one standard deviation shock to the intermediation cost for the US under different parametrization of the housing adjustment cost.
which in turn decreases the investment in the economy. The low demand in the real estate market decreases house prices further, causing an amplification mechanism in the economy by deepening the credit crunch. Low income demotivates households, and the total labor hours decline shows a substitution effect. Because the future income of patient households increases due to rising interest rates, they save less and consume more. This causes an initial rise in total consumption, but as the credit crunch becomes more severe, consumption declines as well. Increasing the housing adjustment cost magnifies some of the responses. High adjustment costs make it costly to use the housing sector as a buffer, creating higher volatility in the economy.

6.2. Comparison of the US and Turkey:

Figure 10 presents an important counter-factual by documenting the role of financial development levels in creating ECV differences across countries. The figure shows the responses of the key macroeconomic variables to a standard deviation decrease in TFP while the stochastic processes in both financial sectors are turned off (i.e., there is no financial shock). Even though the US is significantly more developed than Turkey, a TFP shock creates similar responses in both countries. The US and Turkey, therefore, also experience similar volatilities. As a result, the figure shows that financial development differences alone cannot account for the higher ECV in Turkey.

A shock to intermediation costs, however, creates significant volatility differences by amplifying the effects dramatically in Turkey relative to the US. Figure 11 shows that
Notes: The figures show the responses of key macroeconomic variables to a one standard deviation shock to the TFP for the US and Turkey. Because the housing adjustment cost is estimated to be close to zero in data, I only use $\phi = 0$ to compare the two countries. Increasing the adjustment cost values do not change the general results.
output, consumption and house price responses are around seven times more than those in the US, and responses of Turkey’s investment, labor hours and loan rates are almost five times larger than the US. In other words, the negative effects of a financial crisis on key macroeconomic variables would have been on average six times worse in the US, if the US had the same financial sector as Turkey.
7. Conclusion:

This paper explains the effects of financial intermediation cost differences across countries on their respective excess consumption volatilities (ECV). This paper undermines the long-held assumption that the development levels of financial systems lead to lower ECVs due to higher consumption smoothing possibilities. I have shown, instead, that the volatility of the financial sector plays the ultimate role in determining ECVs. Since some developed financial systems are actually more volatile than others, concentrating on financial development level differences is misleading in cross-country comparisons. The paper also demonstrates that if the US had the same intermediation cost structure as the average emerging country then the decline in production, consumption, labor and real estate markets, and business investment following a financial shock would increase sixfold, on average.

The model successfully replicates the volatility differences observed in the data. The results shows that the median country of emerging countries, Turkey, is four times more volatile than the US in terms of relative consumption to output. The model suggests that if the US had the same financial sector with Turkey, a shock to the financial intermediation cost would cause seven times larger negative effects on output, consumption and real estate market indicators, on average. Moreover, the negative effects on investment, financial sector and labor hours would be five times larger by the time the trough occurs in the recession. This paper indicates that financial intermediation costs have a very significant role in creating frictions and amplifying the negative effects in an economy, a finding that may prove
important for future research on the sources of macroeconomic volatility.
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FRED, Federal Reserve Economic Data, Federal Reserve Bank of St. Louis: Total Assets, All Commercial Banks; Board of Governors of the Federal Reserve System;


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Appendix A:

Using consumption and GDP data from the Central Bank of the Republic of Turkey and the U. S. Bureau of Economic Analysis (BEA), Table A1 compares the volatility of macroeconomic variables from 1998:1 to 2009:4 for Turkey and the US. I use the X-12 ARIMA method to seasonally adjust the Turkish consumption and output data to maintain consistency with the BEA data for the US.

Traditionally, aggregate consumption includes housing consumption, i.e. housing services and utilities. To differentiate the sources of volatility and make the data consistent with the model, I deduct housing consumption from aggregate consumption, and therefore from aggregate output, for both countries and report these findings separately on the "no housing" part of Table A1.

Table A1 shows that consumption and output volatilities in both countries increase when the housing market is separated from aggregate consumption and output measures because housing services are known to be more stable. For instance, rents are usually fixed for a year and changes in the real value are usually very little over time. Table A1 further shows that consumption volatility in the US is around 8 (9) times lower than in Turkey when housing consumption is separated from (included to) aggregate consumption. Similarly, output volatility in the US is around 8 times lower than in Turkey, with or without a housing sector. Moreover, the relative volatility of consumption share is 3.25 percent for Turkey, whereas it is only 0.58 for the US independent of including a housing sector. This
Table A1: Volatility of Macroeconomic Variables

<table>
<thead>
<tr>
<th>in percent</th>
<th>with housing</th>
<th>no housing</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>US</td>
<td>TURKEY</td>
</tr>
<tr>
<td>$\sigma(C)$</td>
<td>1.29</td>
<td>12.06</td>
</tr>
<tr>
<td>$\sigma(Y)$</td>
<td>1.43</td>
<td>12.71</td>
</tr>
<tr>
<td>$\sigma\left(\frac{C}{Y}\right)$</td>
<td>0.53</td>
<td>3.29</td>
</tr>
<tr>
<td>$\frac{\sigma(C)}{\sigma(Y)}$</td>
<td>0.90</td>
<td>0.95</td>
</tr>
</tbody>
</table>

Notes: Values are in percent. The consumption and GDP are obtained from Central Bank of the Republic of Turkey and BEA for Turkey and the US, respectively. Whereas, exchange rate and GDP deflator data are obtained from the OECD. The variables are deflated with GDP deflators of the corresponding country and their log values are detrended with HP filter before calculating the standard deviations.

A stark difference between the two countries creates the main empirical target for this paper.