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Singapore Consumers' Inflation Expectations and Creation of Singapore Index of Inflation Expectations

by Aurobindo Ghosh and Jun Yu

MasterCard Worldwide Insights/SKBI Working Paper

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Foreword from Singapore Management University

For the past one year, inflation has been in the minds of many Singaporeans. Its movements affect how households, employers and central bankers make decisions. Understanding of the formation of inflation expectation and its impact on various economic decisions is thus instrumental in any discourse on economic policy.

Inflation expectation is important for households to make economic decisions, such as investment, spending and saving. It is also important for firms to determine wages and output since prices are usually market determined. Employers and employees might also negotiate nominal wages based on an expectation of future price changes.

For the central bankers, inflation expectations also provide a basis when they are calibrating monetary policy, as one of the objectives of many central bankers is to maintain price stability in the country.

Thus, it is with great pride that I introduce the inflation expectations index for Singapore, jointly developed by Singapore Management University (SMU)-Sim Kee Boon Institute for Financial Economics (SKBI) and MasterCard. The index is created based on a survey of around 400 randomly selected individuals from households in Singapore. This online survey helps researchers understand the behaviour and sentiments of economic agents in households.

Since its launch in July 2008, SKBI has been developing and applying research on financial economics with special relevance to Singapore and Asia. It has done so through its four Centres— the Centre for Financial Econometrics, Centre for Silver Security, Centre for Asset Securitisation and Management in Asia and Centre for Corporate and Investor Responsibility, and in collaboration with various units in SMU and external partners. Part of its mandate is to engage with industry and the public. The creation of the inflation expectations index is a great example to showcase how SKBI can help industry and the public.

Professor Arnoud De Meyer
President
Singapore Management University

Foreword from MasterCard

As part of our commitment towards driving thought leadership, the MasterCard Worldwide Knowledge Platform was developed to share new perspectives on the dynamics of global economic growth and the evolution of consumer markets across the world through the company's research properties and advisory services.

Knowledge sharing is a central tenet of MasterCard's business. Our thought leadership assets— such as the Insights series of reports and consumer spending surveys— offer timely and valuable information that benefits not just customers, but the broader community. Knowing what drives economies— and why— has never been more important.

The knowledge and ideas that MasterCard shares on consumers and their spending habits highlight important trends and behaviours that dictate and drive global economic performance. As important to MasterCard is the ability to innovate and collaborate with like-minded organisations to build upon this knowledge— organisations such as the Singapore Management University (SMU), with whom we launch our latest knowledge asset.

The Singapore Index of Inflation Expectations looks at a wide range of factors that contribute to inflation predictions. Such research is a valuable barometer of consumer sentiment and expectation; it plays a vital role in understanding and forecasting the behaviours that will in turn influence monetary policy in Central banks. Having surveyed approximately 400 consumers across Singapore, this inaugural Index provides valuable insight on the impact of inflation on the behavioural attitudes of individuals and organisations, especially in light of the current, volatile global economic environment.

MasterCard is delighted to collaborate with the Singapore Management University in launching this important piece of research.

Vicky Bindra
President
Asia/Pacific, Middle East & Africa
MasterCard Worldwide

Sim Kee Boon Institute
for Financial Economics

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Sim Kee Boon Institute for Financial Economics

Singapore Management University

December 16, 2011

Report on the Survey of Singapore Consumers' Inflation Expectations and Creation of Singapore Index of Inflation Expectations (SInDEx)[1]

Aurobindo Ghosh and Jun Yu
Sim Kee Boon Institute for Financial Economics
Singapore Management University
December 16, 2011

Abstract

Central bankers are often in an unenviable position. Their monetary policy and the effectiveness of their policy are largely determined by the expectation of future inflation of consumers and the business sector. Consequently, measuring the inflation expectations is important to the Central bankers.

Unfortunately, obtaining a good measure of inflation expectations in the population is challenging. Most central banks rely on Surveys of Professional Forecasters to benchmark future expectations both in terms of point and probability (density) forecasts. While the forecasts provide an excellent source of disagreement that might exist among experts, it may not reflect well on the disagreement that exists among the economic agents. Similarly, it may not give us a good estimate of the level of uncertainty that exists among the population about future inflation rates. Both the disagreement and the uncertainty are important to measure Central bankers' ability to anchor the inflation target through communications.

The aim of this report is to highlight a broad spectrum of issues that brings about the measurement of the disagreement and the uncertainty and the formation of inflation expectations among economic agents. Through a survey of approximately 400 consumers in Singapore's households we find several interesting results. First, the disagreement and the uncertainty are indeed two different concepts. The uncertainty is larger than the disagreement in Singapore. Second, in the medium term of one year, household decision-making and awareness of economic conditions facing the household play a crucial role forming current expectation. The inflation expectations are also affected by the long term relationship of the individual through citizenship status or length of stay. Third, we find that for the long term or five year ahead, the level of confidence in future equity investment plays a crucial part in expectation formation. Finally, although we find that the level of uncertainty plays a significant role in periods of stress, following media coverage on economic issues plays a very significant role in longer term inflation expectation.

We find the SKBI-MasterCard Singapore Index of Inflation Expectations for the current year (SInDEx1), which is a weighted average of Headline and Core Inflation rates, has remained almost the same in both the September and December waves at 4.62%. The five year ahead SKBI-MasterCard Singapore Index of Inflation Expectations (SInDEx5) has slightly gone down from 5.2% in September to 5.16% in December.

1. Importance of Inflation Expectations

Inflation expectations not only play an important role in understanding and predicting consumer and firm behaviour, but also in galvanising monetary policy for Central banks. A wide range of household decisions, such as investment, spending and saving, are known to be affected by inflation expectations. When prices and wages are set, the expectations of future inflation are often taken into account. If the inflation is expected to be higher in the future, employees may demand higher nominal wages to offset the increasing cost of living and companies may be inclined to increase prices to offset the increasing cost of production. Consequently, there are significant long term impacts of inflation expectations on jobs growth and wage outlook.

High inflation is bad. High inflation injects noise into the price system and makes economic and financial planning difficult. As Bernanke (2007) pointed out, "high and persistent inflation undermines public confidence in the economy and in the management of economic policy generally, with potentially adverse effects on risk-taking, investment, and other productive activities". This is why low inflation is an objective of many Central banks' monetary policy and the control of inflation is vital to good monetary policy. Singapore is no exception.

1. We would like to thank Gladys Ng for comments on the report and all the respondents who have participated in the pilot survey. The views expressed in this report are that of the co-authors and not of SMU or SKBI or MasterCard.

The credibility of Central banks is the key factor to determine the effectiveness of an anti-inflation policy, and naturally, the Central banks need to know how credible they are. The communication between the Central banks and consumers and business sectors is important. For this reason, the Central banks have to communicate inflation target either explicitly or semi-explicitly to anchor long-run inflation expectations of the public. Good communication should help to reduce not only the *disagreement* about future inflation between economic agents but also the *uncertainty* about future inflation of each economic entity, which we view as different concepts.

It is important to point out that inflation expectations are different from inflation forecasts. Central banks may use inflation expectations to improve their inflation forecasts and may also use their inflation forecasts to communicate their inflation target. However, how people form expectations is not a concern *per se* when Central banks obtain inflation forecasts.

2. SKBI-MasterCard Survey of Singapore Consumers' Inflation Expectations

Inflation expectations surveys are the most common instrument for gauging inflation expectations and attitudes. The number of surveys has increased around the world. For example, the widely cited "Livingston Survey" of Professional Economists (conducted by the Federal Reserve Bank of Philadelphia), Reuters/ University of Michigan Survey of Consumers ("the Michigan Survey") and the Bank of England/GfK NOP Inflation Attitudes Survey, use questionnaires on a cross section of experts, individuals or households based on demographic, wage and price related questions. We cannot understate the importance of the accuracy of such surveys. In the US context, it has been succinctly observed that

> *"...The Federal Reserve needs reliable measures of expected inflation to formulate and gauge the thrust of monetary policy. In fact, inflation expectations have become more important to the Fed given the diminished stability of the link between the monetary aggregates and GDP expenditures since the early 1980s, and the greater role which has been thrust upon expected real short-term interest rates in the implementation of Federal Reserve policy." (Thomas Jr., 1999, p. 125)*

In Singapore, the Monetary Authority of Singapore (MAS) Survey of Professional Forecasters has a long history. The Survey, which has been conducted quarterly since 1999, collates and publishes forecasts produced by 20-30 professional economists and analysts covering the key macroeconomic indicators of Singapore economy, including GDP, expenditure components, sectorial variables, financial variables, unemployment rate, and inflation. Both point forecasts and density forecasts are elicited. In particular, inflation expectations are captured through the inflation forecasts at three different forecast horizons: an annual average forecast for the current calendar year, the next calendar year, and for the current year's quarters. The instrumental question asked is about the year-to-year growth in percentage terms on Consumer Price Index (CPI).

The SKBI-MasterCard Survey of Singapore consumers, which has been conducted since September 2011, collects answers to carefully targeted questions designed by us, from about 400 randomly selected consumers in Singapore. Before we fielded the full survey at this big scale, we ran two pilot surveys, one offline with 104 respondents and one online with 22 respondents. These two pilot surveys not only helped us to fine tune our questionnaire but also gave us similar results to what we eventually obtained from the formal full-scale survey.

We now discuss some of the unique features of our Survey in the Singapore context.

First, we use a reasonably large sample size, in the neighbourhood of 400 consumers. We understand that the number of respondents varies widely in the existing inflation expectations surveys. The oldest continuous survey for inflation and other key macroeconomic variable expectations, started as early as 1946, was a semi-annual survey with as few as 10-60 professional economists. The much broader scale quarterly BOE/Gfk NOP Inflation Attitudes Survey, May 2011 used 2000 respondents and interviewed a quota sample of 2045 (Barnett et al, 2010). The New York Fed in collaboration with others started the Household Inflation Expectation Project (HIEP) in 2006 and conducted a modification of the Michigan Survey with 500 respondents each month (Bruine de Bruin et al., 2010). Philadelphia Fed Survey of Professional Forecasters used about 44 experts and the

MAS Survey used about 20-30 experts. Some of these surveys are conducted based on the assumption of a representative cross section of the households or decision-making individuals. We recommend that 400 respondents should be sufficient for our purpose since Singapore is a city-based economy and has less regional heterogeneity than many other countries.

Second, we are careful with the choice of wording of the questions. One of the major issues identified by survey designers is that *"... relatively little is known about how respondents interpret the survey questions, how their interpretation affects their responses, and how much their expectations influence their behaviour and beliefs about the economy..."* (Bruine de Bruin et al., p. 1). This has implications on both the accuracy of the results vis-à-vis the assumptions of rationality of individuals (Thomas Jr., 1999). One important aspect of the question asked in the Michigan Survey is what changes respondents expect of "prices in general". Although this is a simple question, it brings forth different interpretations, depending on the actual prices faced by individual respondents, rather than addresses the issue of overall "inflation expectation". Hence, a better worded though more difficult to interpret question of expectation of "rate of inflation" was asked. Studies suggest that there is relatively little lost in terms of a surge of non-response (less than 1% more as suggested in p. 3, Bruine de Bruin et al., 2010). Such questions also somewhat reduce the respondent-specific variation as documented in Michigan Surveys, for example, related to demographic and wage characteristics of the respondents.

In our opinion, there are a few potential sources of bias involved in providing past period's information. First, the given inflation number could be misleading as there might be an inordinate number of respondents with little or no information, who choose the same number for 12 months and five years inflation expectation figures. Second, summarised inflation data provided to the respondents for each component is not authorised to be distributed, and might indirectly force the respondents to choose that number. Finally, while we would prefer an exact numerical measure, the accuracy of the result is more important than getting a precise numerical value. For example, giving an open option might lead to psychological or behavioural bias (like choosing multiples of 5 or 10). It can also lead to potential numbers that are implausible like in 100's or 1000's, thus possibly creating statistical outliers. Given the possible sources of opposing bias and their ambiguous overall outcomes, standard questionnaires like the Bank of England/GfK NOP Inflation Attitude survey, to the best of our knowledge (see http://www.bankofengland.co.uk/statistics/nop/survey0511.htm), do not include open-ended numerical questions or give past data values in the questionnaire. We prefer to give the option to include most likely categories that include the average from the past period. This will also help us to compare across countries in the region and the world. So we would prefer to have the questions in multiple choice options format that will include all possible ranges of values.

Third, we explicitly ask questions about the *core inflation* as well as the *headline inflation*. The headline inflation is an overall inflation affecting all expenditures, whereas the core inflation excludes food and energy expenditures (Bullard, 2011; Lenza and Reichlin, 2011 and references therein). One aspect that has largely been ignored in many surveys of either consumers or experts' expectation is the type of "rate of inflation" that is being investigated. A major debate as discussed by St. Louis Fed's president James Bullard in the policy and academic community is whether overall or "headline inflation" is more important as a policy tool than "core inflation" (Bullard, 2011a, 2011b; Lenza and Reichlin, 2011 and references therein). The thrust of the argument is that while core inflation is less volatile than headline inflation, individuals care about headline inflation more than core. Hence, we would keep a question on "prices in general affecting individual households" (related to headline inflation), as well as, questions on "rate of inflation" (related to core inflation). Currently used surveys do not address this question.

In the Singapore context, we have further explicitly paid attention to accommodation and transport expenditures and created new concept named "Singapore core inflation". Singapore core inflation excludes accommodation and transport expenditures and will help us achieve two different objectives. First, it will help us compare Singapore with other countries in the region

and across the globe. Second, it will also help us compare Singapore inflation over time. Furthermore, it also affords us the opportunity not to venture a guess into household's basket composition and how that has changed over time.

Fourth, we collect information about the demographic and socioeconomic characteristics of respondents. There is documented evidence that demographic characteristics have an effect on inflation expectations as corroborated by Bruine de Bruin et al. (2010). Hence, we ask questions on both demographic characteristics (such as age, education, gender, marital status, citizenship) and wage or salary information (both current and expected) to address those concerns. Moreover and perhaps more importantly, we also believe some of the demographic and socioeconomic characteristics of consumers are potentially helpful to understand how individuals form their expectations. Finding factors that may influence the formation of inflation expectations of consumers and the business sector is important to Central Banks to improve their communication with the public.

Fifth, to address the medium and long term expected inflation, we asked questions that are directed to extract that information (one year and five years).

Sixth, we hope to address emerging documented evidence that more media scrutiny about inflation expectation might change individual perception (Carroll, 2003).

Finally, we believe the *disagreement* about future inflation between economic agents and the *uncertainty* about future inflation of each economic entity are different concepts, although in the literature, researchers often use the former to approximate the latter. In addition to measuring the disagreement, we would like to include a measure of probabilistic uncertainty. To do so, we followed the MAS Survey by eliciting both the point forecasts like average and the subjective density forecasts.

3. The Data

The data for the SKBI-MasterCard Survey was collected online from about 400 consumers. The sampling was done using a quota sample over gender, age and residency status to ensure representativeness of the sample. Employees in some sectors like journalism, marketing etc. were excluded as that might have had an effect on their responses to questions on consumption behaviour and expectations. The design of the question was paid a lot of attention, to reduce as much bias as possible.

For the first wave fielded in the last week of September 2011, we have 400 individuals surveyed and asked a variety of demographic, socioeconomic and expectations questions about the values of economic variables in one to five years into the future. The December 2011 wave was fielded in the first week of December 2011. We added questions about investors' sentiment on current and future equity investments.

The September survey showed that approximately 49.8% of the respondents were female and the average age was 34.4 years. The December 2011 survey with 407 respondents had almost the same proportion of female respondents with exactly the same average age of 34.4 years. We further noted for the September wave, about 60.3% of the respondents had at least some college education and about 46.9% were married. The rate of respondents with some college education went down to 55.8%, with overall about 51.3% being married in the second wave in December. This is fairly representative demographically using quota sample, thus the summary statistics based on this would give a pretty accurate outlook of the wider population. In the first wave, about 88% of the respondents were citizens and 99.3% have stayed in Singapore more than two years. The summary statistics suggests a slight decrease in the proportion of citizens who responded to 85.3% in December wave, and to 97.8% in proportion of respondents who have stayed longer than two years in Singapore.

From a socioeconomic decision making perspective, in the first wave approximately 83.5% of the respondents consider themselves at least joint decision makers of the household, while a staggering 93.8% claimed that they are aware of how global economic crisis can

affect the household finances. In the December wave approximately 80.5% of the respondents either primarily or jointly make economic decisions in the household, while 92.1% were aware of how economic issues can affect their households. In September (and December) waves, we observed that more than 96.8% (and 96.1%) of the individuals who responded were either decision makers in the household or knew about problems facing their household vis-à-vis the global economic conditions. Finally, 91.8% and 89.4% of the individuals surveyed were at least somewhat aware of the media reports on global and local economic conditions in the first and second waves respectively. We further note that the median per capita personal income of the respondents in both waves is $37,500, while household income is on an average $75,000 per annum.

In some aspects, the first two waves showed re-

Chart 1A. Disagreement versus Uncertainty for the Headline Inflation

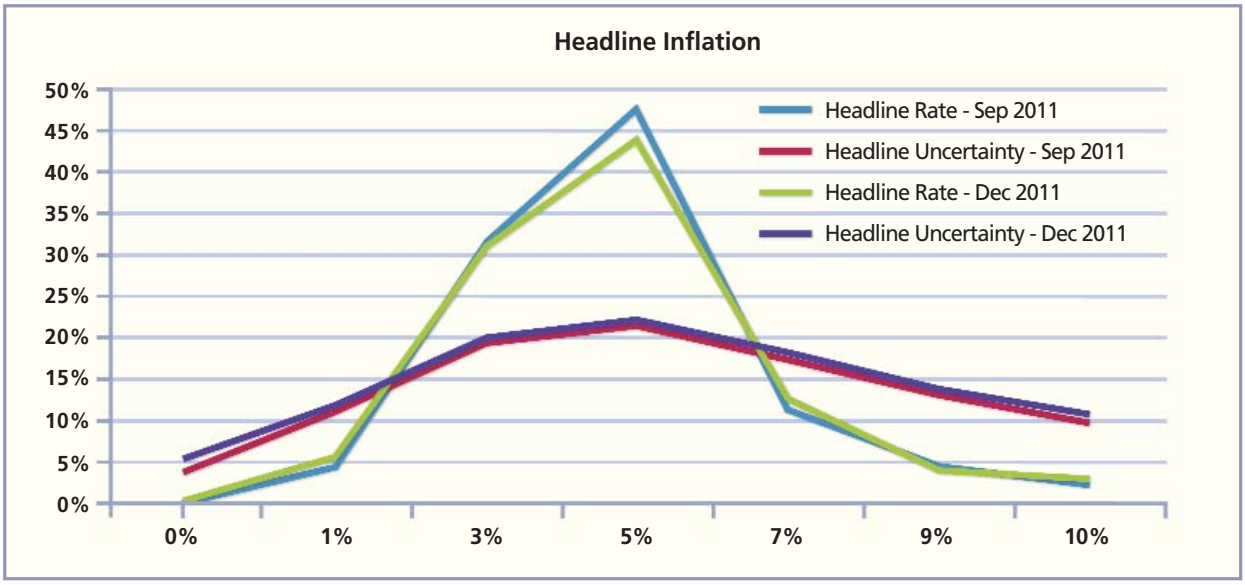


Chart 1B. Disagreement versus Uncertainty for the Core Inflation

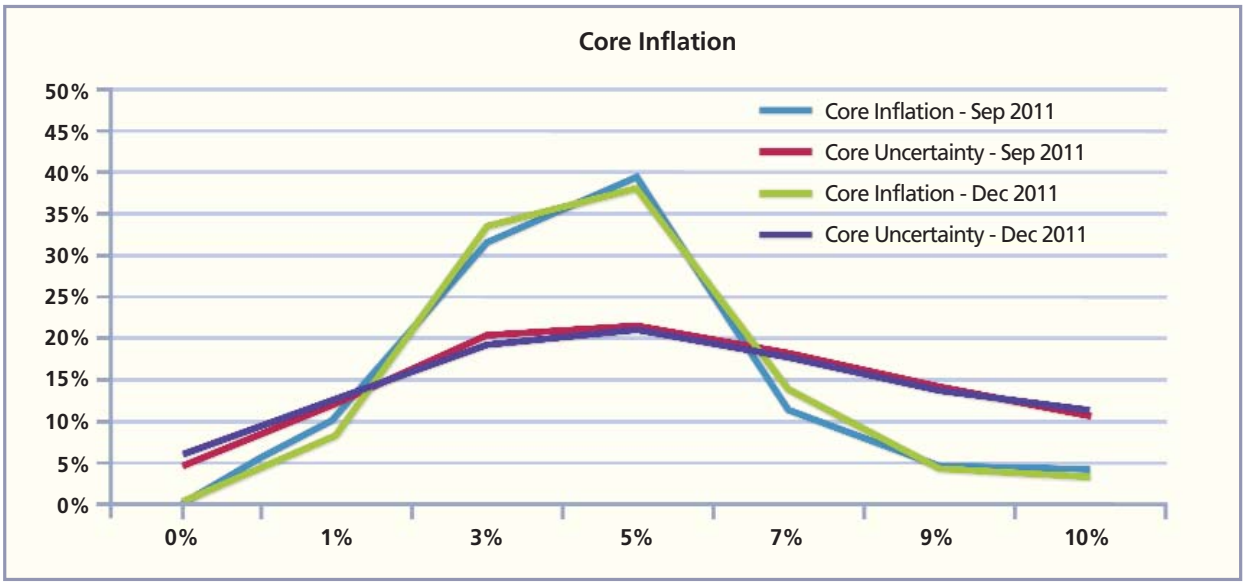
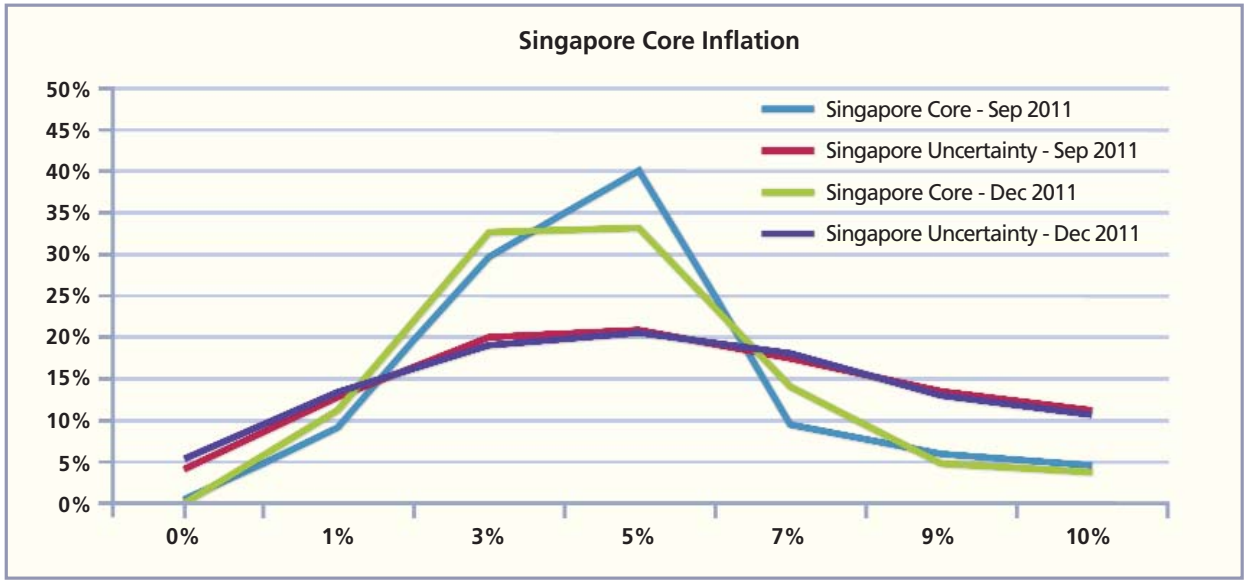


Chart 1C. Disagreement versus Uncertainty for the Singapore Core Inflation



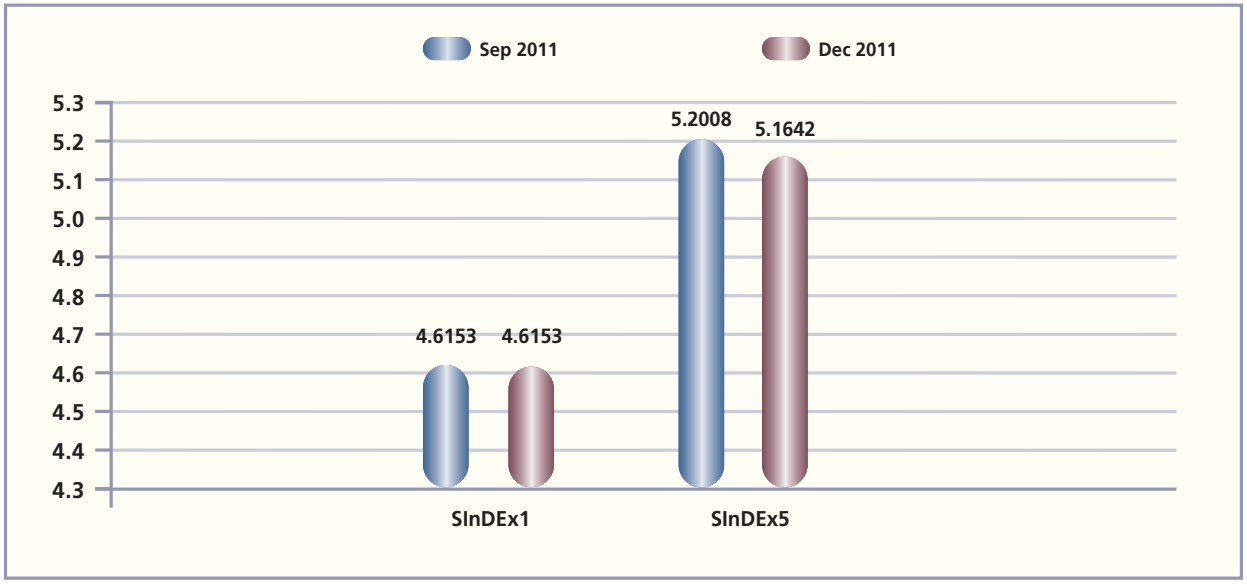
markably similar features, while in some other aspects they were remarkably different. At the outset we should clarify that the questions formulated were specifically designed to elicit information about perception, and by no means are they corroborative of effectiveness of communications of the authorities. In fact, as is clear from the summary measures, the economic agents respond significantly to changing economic conditions both in the macroeconomic sense globally, and in a micro-economic sense with individual level decision making and incentives.

In the first wave the apparent consensus average expectation of household income increment was 0.5%, while the same number in the second wave was 0.95%. Although the median response was 0% in both cases, this seems to suggest there might be a slight (0.45%) increase in the sentiment of wage increment over the next 12 months. On the other hand, the perception in September 2011 from the panel was that over the next 12 months, the Singapore dollar will depreciate by 0.94% against the US dollar. However, following the global turmoil including the sovereign debt crisis in both Europe and the United States, the perception of the sample in the December 2011 wave was 0.04% or virtually zero. So there was a mean difference of 0.9% between the two waves, although the median was 0% in both cases.

For the December wave, we also asked some additional questions on investors' sentiment on current and future equity investments. It turns out that around 16.6% of the investors are currently invested in the equity market and around 14.4% hold assets in other asset markets. However, on an average only about 14.4% want to stay invested in equity over the next 12 months. Hence, as we can see, the first two waves of the survey did reveal some startling changes in perceptions very much in line with an informed and interactive workforce responding to cues globally as well as locally.

One of the central issues in monetary policy formulation by Central banks is effective communication about future inflation expectation formation to the economic agents. This will purportedly ensure both stability of prices and the correct anchoring of prices in spite of shocks to aggregate demand (Bernanke, 2007). However, effectiveness of the monetary policy is manifested through two different forms of *discordance*. First, individuals would have different expectation of the future expected inflation rate. This *disagreement* is reflected in Chart 1A-C as the blue (September) and green (December) curves that show the proportion of individuals who have different opinions about what the expected headline inflation rate would be in the current year. The second one is the level of *uncertainty* they have about their own projections of the inflation expectation. This un-

Chart 2. SInDEx1 and SInDEx5 in September 2011 and December 2011



certainty is showing up in the red (September) and purple (December) curves. The height of the curve reflects the degree of confidence they have that inflation will fall in those regions one year from now. It appears that in Chart 1A, headline inflation disagreement is slightly more spread out in December wave compared to September. This theme is repeated for both the core inflation rates. On the other hand, levels of uncertainty are remarkably similar in all three charts for both waves. In all cases, uncertainty is larger than disagreement.

4. SKBI-MasterCard Singapore Index of Inflation Expectations (SInDEx)

From the answer to three questions about the headline inflation, the core inflation and the Singapore core inflation in the next one year and three questions about the headline inflation, the core inflation and the Singapore core inflation in the next five years, we create the SKBI-MasterCard Singapore Index of Inflation Expectations (SInDEx). Before we discuss how the index is created, we first review the summary statistics of these six variables in the two waves.

First, let us look at the one-year inflation expectations. For the September wave, we find that the current headline inflation rate based on 400 online respondents has a mean of 4.68% with a standard deviation of 1.84%. In the December wave mean of the headline inflation rate is slightly elevated to 4.7% with a standard deviation of about 1.96%. For the core inflation rate, our September wave reports a mean of 4.54% with a standard deviation of 2.18%. The core inflation rate for the December wave has a mean of 4.59% with a standard deviation of 2.1%. Finally, for the Singapore Core rate, the first wave gives 4.67% with a standard deviation of 2.28%, while in the December wave decreased to 4.58% with a standard deviation of 2.3%. The September rates are comparable to the September number of 4.5% from the MAS Survey based on CPI, although it is unclear to us if the MAS result is for the core inflation rate or the Singapore core inflation rate or the headline inflation rate. However, our December rate of current inflation expectation is considerably higher than the December number of 3.1% by MAS Survey of experts for 2012.

Second, let us look at the five-year inflation expectations. The September wave suggests that the headline inflation rate has a mean of 5.39% with standard deviation of 2.34%, while that of the December wave has a mean of 5.30% with standard deviation of 2.35%. The mean of the expected core inflation rate is down to 5.21% with standard deviation of 2.18% in September, and 5.09% with standard deviation of

2.43% in December wave. Finally, the Singapore core inflation rate has a mean of 5.03% with standard deviation of 2.36% in the first wave. In the December wave the mean of the expectation becomes 5.09% with a standard deviation of 2.49%.

To create the SKBI-MasterCard Singapore Index of Inflation Expectations (SInDEx), we propose to use an equally weighted index of the headline and the two core inflation expectations for both the current year and five-year forward expectation. The current year inflation expectations rate, denoted SInDEx1, is 4.62% with a standard deviation of 1.79% in the September data wave. In the December wave it remains unchanged at 4.62% with a slightly larger standard deviation of 1.86%. The 5-year inflation expectations rate, denoted SInDEx5, is 5.2% with a standard deviation of 2.02% in September. The second wave in December gives the SInDEx5 rate is 5.16% with a standard deviation of 2.15%. So there is a slight decrease in the SInDEx5. Chart 2 shows the SInDEx1 and SInDEx5 rates in the two waves. While the one-year rate, SInDEx1, is stable over the two periods, the five-year rate, SInDEx5, has shown a slight drop.

5. Formations of Inflation Expectations

Our objective in this report goes beyond only the release of the SKBI-MasterCard SIndEx measures as we observed over the two waves in September and December. We delved into the formation of such expectations with the data that we have analysed. To do so, we regress one of the three inflation expectation variables analysed in Section 3 and the two SInDEx indices created in Section 4 on all the economic variables that we collected in the September wave and in the December wave, hoping to identify important factors that influence the inflation expectations. Regression results are reported in Tables 1A/B.

First, we look at the regression results from the one-year rates. When the headline inflation expectations are used as the dependent variable in the September wave, we find that citizens felt the one-year headline inflation rate is higher than non-citizens, although individuals who have lived in Singapore longer than two years thought that the rate is significantly lower than residents who have been in Singapore for shorter duration. We further observe that individuals who are primary or joint decision makers of the household opined that overall inflation rate has gone up more than the non-decision makers. The second wave in December had some distinctly different responses, which revealed how the economic conditions globally had an impact on how individuals form expectations. For example, individuals who were aware of how economic conditions affected their households, expected the inflation rate to be higher than the rest. However, individuals who were either decisions makers in their respective households or were aware of economic conditions affecting them had a significantly lower expectation.

One way to explain this apparent anomaly was that prices seem higher than they actually were in the context of the global economic outlook. Those who follow media reports seem to have somewhat lower inflation expectations. The expected increment of the individual income also seemed to have increased the inflation expectation, or they might have co-evolved. Individuals with higher expectation of the value of Singapore dollar with respect to the US dollar also expected inflation rate to be lower on an average. In the December wave, we also observe that future equity investments can be taken to be a predictor that positively affects inflation expectations. This indeed is quite reasonable for those who like to hedge against inflation rate risk. The analysis does indeed give a unique perspective on individuals' expectation formation in terms of the overall price changes.

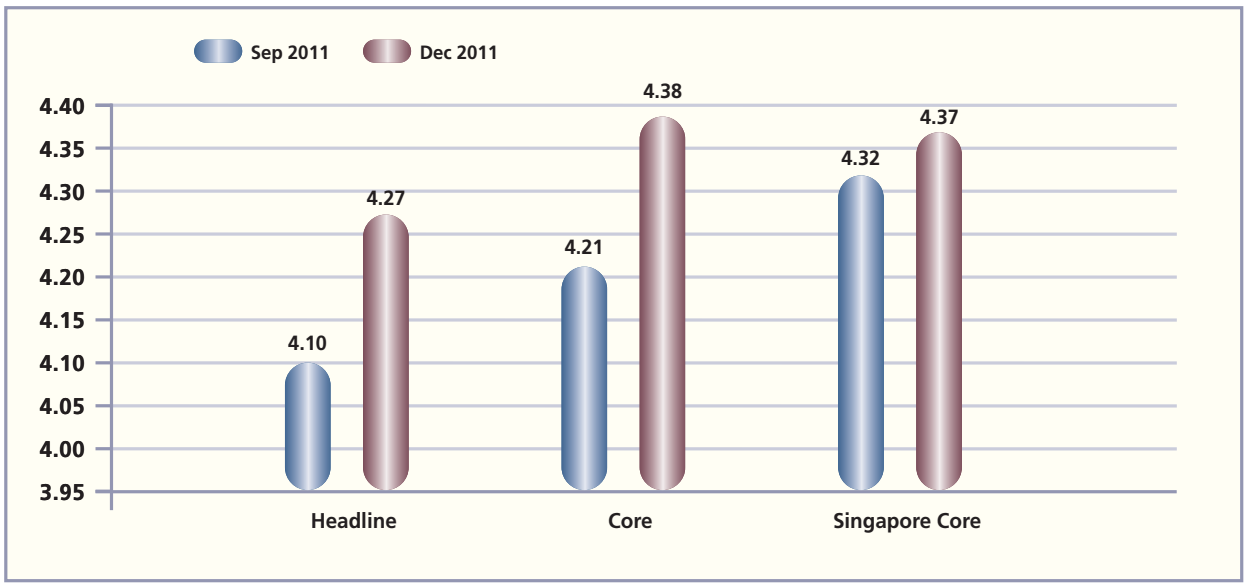
When the core inflation expectations are used as the dependent variable, we get a slightly different picture. The main difference in the first wave is that age and personal income plays a small role in determining expectation. Citizenship status continues to have an impact on increasing the inflation expectations, as do decision making roles in household or interaction with awareness of economic conditions. The December wave reveals that married status and awareness of economic issues tend to increase expectations of the core inflation rate. Once again, plans for increased future equity investments tend to suggest higher inflation expectations.

Table 1A. Current Expectation Formation from September and December Waves

	Headline 1		Core 1		Singapore Core 1		SInDEx1	
Variables	Sep 2011	Dec 2011	Sep 2011	Dec 2011	Sep 2011	Dec 2011	Sep 2011	Dec 2011
Age	0.01 (0.01)	0.01 (0.01)	-0.02 * (0.01)	0.00 (0.02)	-0.02 (0.02)	0.01 (0.02)	-0.01 (0.01)	0.01 (0.01)
College	-0.15 (0.24)	0.01 (0.01)	-0.18 (0.29)	-0.22 (0.24)	-0.07 (0.29)	-0.06 (0.28)	-0.14 (0.22)	-0.15 (0.22)
Female	-0.03 (0.21)	0.01 (0.01)	0.41 (0.26)	-0.26 (0.21)	0.41 (0.28)	-0.1 (0.26)	0.26 (0.21)	-0.26 (0.21)
Married	0.08 (0.25)	0.06 (0.27)	0.36 (0.28)	0.53 * (0.3)	0.50 (0.32)	0.4 (0.31)	0.30 (0.24)	0.35 (0.16)
Personal Income	0.01 (0.00)	0.00 (0.00)	0.01 * (0.01)	0.00 (0.01)	0.01 (0.01)	0.00 (0.01)	0.01 (0.00)	0.00 (0.00)
Household Income	-0.00 (0.00)	0.00 (0.00)	-0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	-0.00 (0.00)	-0.00 (0.00)	0.00 (0.00)
Singaporean	0.74 *** (0.26)	0.19 (0.32)	0.77 ** (0.34)	0.44 (0.32)	0.40 (0.39)	0.5 (0.37)	0.61 ** (0.29)	0.36 (0.29)
More than 2 years	-2.82 *** (0.63)	0.08 (0.69)	-1.6 (1.42)	-0.12 (1.06)	-1.26 (1.38)	0.81 (0.79)	-1.8 * (1.05)	0.25 (0.62)
Household Decision Maker	0.77 ** (0.34)	0.15 (0.36)	0.71 (0.41)	0.06 (0.31)	0.11 (0.49)	-0.07 (0.41)	0.01 (0.37)	0.01 (0.33)
Aware of Economic Issues	-0.86 (0.72)	1.69 ** (0.66)	-0.66 (0.76)	1.86 *** (0.7)	-0.74 (0.77)	1.78 (0.76)	-0.42 (0.60)	1.85 *** (0.6)
Aware Decision Maker	1.44 (0.88)	-1.97 ** (0.91)	1.68 * (1.01)	-1.1 (0.9)	1.13 (1.18)	-1.63 (1.02)	1.01 (0.90)	-1.72 *** (0.82)
Follow Media Reports	0.28 (0.36)	-0.98 ** (0.5)	0.69 (0.49)	-1.49 (0.61)	0.3 (0.58)	-0.82 (0.58)	0.57 (0.44)	-1.14 ** (0.45)
Expected Household Increment	0.02 (0.02)	0.05 *** (0.02)	0.02 (0.02)	0.02 (0.02)	0.02 (0.02)	0.02 (0.02)	0.02 (0.02)	0.03 * (0.02)
Expected Exchange Rate Change	-0.00 (0.02)	0.07 *** (0.03)	-0.01 (0.02)	-0.01 (0.03)	0.01 (0.02)	0.05 (0.03)	-0.01 (0.02)	-0.04 * (0.02)
Uncertainty of HL Expectation	0.01 (0.07)	0.09 (0.07)					0.06 (0.06)	0.14 ** (0.06)
Uncertainty in CO Expectation			0.00 (0.09)	0.09 (0.07)				
Uncertainty of SC Expectation					0.14 * (0.08)	0.14 * (0.07)		
Current Equity Investment		0.01 (0.01)		-0.00 (0.01)		-0.01 (0.01)		-0.00 (0.01)
Future Equity Investment		0.03 ** (0.01)		0.03 (0.01)		0.04 (0.01)		0.03 *** (0.01)
Other Investments		-0.00 (0.01)		0.00 (0.01)		0.00 (0.01)		-0.00 (0.01)
Intercept	4.99 *** (0.93)	4.51 *** (1.04)	3.56 *** (0.02)	3.82 (1.36)	4.19 ** (1.63)	2.64 ** (1.19)	4.05 *** (1.26)	3.68 *** (0.94)
Sample Size R-squared	327 0.1	321 0.13	329 0.08	322 0.12	330 0.05	322 0.11	327 0.08	321 0.15

* significant at 10%, ** significant at 5%, *** significant at 1%. White's consistent standard errors used when needed.

Chart 3. Uncertainty about the Three Rates, Measured by the Inter-quartile Range, in September 2011 and December 2011



When the Singapore core inflation expectations is used as the dependent variable, uncertainty about the future economic conditions seems to play the most significant role when the one-year core inflation expectations is used as the dependent variable. This regularity information of expectations was observed in both waves. In addition, in the December wave the "revealed preference" in continued investment in the equity market also shows up with a significant explanatory power.

When SInDEx1 is used as the dependent variable, both citizenship status and duration of stay in Singapore are important from the September wave. In the December wave, SInDEx1 is higher for individuals who are aware of economic issues compared to non-decision makers in the household. However, as with the headline rate, the SInDEx1 rate is lower for individuals who are also decision makers. In particular, it seems like those who follow media reports have a lowered inflation expectation. Moreover, other factors like expected household income increment and level of uncertainty in the economic conditions tend to make inflation expectations worse. The expected appreciation of Singapore dollar tends to lower the inflation expectation. Finally, future equity investment holdings predicts expected inflation rate albeit possibly as a hedging mechanism against future price level increase. Overall, SInDEx1 performs the best in terms of the most explanatory power. Chart 3 shows the levels of uncertainty measured in terms of the inter-quartile range or difference between the 75th and 25th percentile have increased for all three current inflation rates between September and December waves. This is indeed quite remarkable reflection of current economic conditions.

Second, we look at the regression results from the five-year rates. When the headline inflation expectations are used as the dependent variable in the September wave, statistically, the rate was affected by whether the respondents were Singaporeans, whether they were aware of the economic conditions affecting the household, and whether they closely followed media reports on the economy. The expectations were higher for citizens and for those who followed media reports. The results from the December wave were slightly different. Individuals who have been in Singapore longer than two years (and not necessarily Singaporeans) felt that the headline inflation rate would go down. Female respondents expected inflation to be lower, while individuals with positive expectation of increment in household income also felt inflation had gone down marginally compared to the rest. Another remarkable feature is that the level of uncertainty individuals had about their inflation expectation increases

their expectation of the overall price level change in the economy five years ahead. The model remarkably improves with the inclusion of the current year forecast for all three 5-year expectations models (not reported here).

When the core inflation expectations is used as the dependent variable, we find that in the September release of the dataset, none of the independent variables played a significant role in determining the expectations. In the December wave, however, a much more interesting pattern appeared where the interplay between household decision making power and awareness of economic conditions seems to lower inflation expectations, while awareness of economic issues alone tend to increase the expectations. We also found that being married slightly increases the perceived expectations of 5-year inflation rate.

When the Singapore core inflation expectations are used as the dependent variable, the pattern for expectations from the September wave reveals that there is slight predictive ability in marital status, and a more powerful predictive ability in awareness of economic conditions. This last variable as before also reflects the implicit role played by social, electronic or traditional media that disseminates information in forming expectations. As before, the December wave highlights a range of possible factors like future equity holdings. The very distinctive interaction term of decision making power and awareness is highly significant, and lowers the inflation expectation five years down the road.

When SInDEx1 is used as the dependent variable, we find that strong predictive ability of marital and citizenship status, as well as highlights media's role in forming expectations in the first wave. In the second wave, SInDEx5 is affected by awareness and interaction variable of informed decision-making, besides uncertainty about the future economic conditions and future asset holding pattern.

6. Conclusion

Multiple objectives were met in carrying out this project. First, by carefully designing a survey we hope to be able to improve measures of inflation expectations for the purposes of helping policymakers to monitor key aspects of consumer inflation expectations and to check the effectiveness of their communications. Second, we create a new Singapore inflation expectations index (SInDEx) that is potentially useful for policymakers. Third, we provide a detailed analysis of how consumers form and update their expectations.

Some interesting empirical results have been obtained. First, two indices have been created, SInDEx1 and SInDEx5, to measure the 1-year inflation expectations and the 5-year inflation expectations. SInDEx1 is 4.62% both in September and in December. SInDEx5 is 5.2% in September and is 5.16% in December. Second, we have found strong evidence that disagreement and uncertainty are indeed different concepts. Both surveys suggest that uncertainty is larger than disagreement. Third, we have identified some factors that influence inflation expectations. One of the strongest and persistent factors is the exposure to media coverage of global economic issues.

Table 1B. 5 Year Expectation Formation using February and December Waves

	Headline HLS		Core COS		Singapore Core SCS		SInDEx5	
Variables	Sep 2011	Dec 2011	Sep 2011	Dec 2011	Sep 2011	Dec 2011	Sep 2011	Dec 2011
Age	0.02 (0.01)	0.01 (0.02)	-0.02 (0.02)	0.01 (0.02)	-0.02 (0.02)	-0.01 (0.02)	-0.02 (0.01)	-0.01 (0.01)
College	-0.00 (0.27)	0.12 (0.30)	0.20 (0.30)	-0.18 (0.31)	0.24 (0.31)	-0.11 (0.3)	0.15 (0.26)	-0.04 (0.27)
Female	0.29 (0.26)	-0.53* (0.28)	0.31 (0.29)	-0.36 (0.28)	0.21 (0.3)	-0.06 (0.26)	0.27 (0.25)	-0.32 (0.24)
Married	0.46 (0.3)	0.20 (0.35)	0.46 (0.32)	0.71** (0.34)	0.61* (0.33)	0.38 (0.36)	0.50* (0.28)	0.44 (0.29)
Personal Income	0.01 (0.01)	-0.00 (0.01)	0.00 (0.01)	-0.00 (0.01)	0.00 (0.01)	-0.00 (0.01)	0.00 (0.01)	-0.00 (0.00)
Household Income	-0.00 (0.00)	0.00 (0.00)	-0.00 (0.00)	0.00 (0.00)	-0.00 (0.00)	0.00 (0.00)	-0.00 (0.00)	0.00 (0.00)
Singaporean	0.79** (0.37)	0.64 (0.41)	0.51 (0.40)	0.13 (0.45)	0.79* (0.41)	0.21 (0.44)	0.67* (0.34)	0.31 (0.35)
More than 2 years	0.86 (0.63)	-1.97** (0.98)	-0.82 (1.42)	-0.96 (0.92)	0.45 (1.44)	0.31 (1.02)	0.25 (1.23)	-0.88 (0.74)
Household Decision Maker	-0.72 (0.46)	0.34 (0.42)	-0.16 (0.50)	0.06 (0.41)	-0.14 (0.52)	0.49 (0.42)	0.31 (0.43)	0.26 (0.39)
Aware of Economic Issues	-1.38* (0.75)	1.42 (1.07)	-0.98 (0.79)	2.17** (1.07)	-1.60** (0.8)	2.94 (0.72)	-1.02 (0.71)	2.23*** (0.71)
Aware Decision Maker	1.44 (1.13)	-1.40 (1.25)	0.91 (1.21)	-2.86** (1.29)	0.76 (1.23)	-4.49*** (1.01)	0.59 (1.06)	-2.92*** (0.96)
Follow Media Reports	1.52*** (0.56)	-0.69 (0.70)	0.98 (0.60)	-0.72 (0.70)	0.98 (0.61)	-0.92 (0.71)	1.30** (0.52)	-0.79** (0.54)
Expected Household Increment	0.02 (0.02)	0.04* (0.02)	0.02 (0.02)	0.04 (0.02)	0.02 (0.02)	0.01 (0.02)	0.02 (0.02)	0.03 (0.02)
Expected Exchange Rate Change	-0.01 (0.02)	-0.03 (0.03)	-0.02 (0.03)	-0.03 (0.04)	-0.01 (0.03)	-0.02 (0.03)	-0.01 (0.02)	-0.08* (0.03)
Uncertainty of HL Expectation	0.00 (0.08)	0.16* (0.08)					0.06 (0.07)	0.14** (0.07)
Uncertainty in CO Expectation			0.08 (0.08)	0.10 (0.09)				
Uncertainty of SC Expectation					0.09 (0.08)	0.07 (0.09)		
Current Equity Investment		0.00 (0.01)		-0.01 (0.01)		-0.02 (0.01)		-0.01 (0.01)
Future Equity Investment		0.01 (0.01)		0.02 (0.01)		0.04** (0.02)		0.02* (0.01)
Other Investments		0.00 (0.01)		0.00 (0.01)		0.00 (0.01)		0.00 (0.01)
Intercept	3.56** (1.58)	6.57*** (1.47)	4.69** (1.69)	6.47*** (1.35)	3.67** (1.71)	5.89*** (1.47)	3.77** (1.48)	6.17*** (1.10)
Sample Size R-squared	328 0.07	322 0.10	330 0.04	322 0.10	329 0.05	322 0.10	327 0.06	322 0.11

* significant at 10%, ** significant at 5%, *** significant at 1%. White's consistent standard errors used when needed.

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